

Calc Weekly Review 3 0910

- 1) Evaluate each of the following limits algebraically and discuss the continuity of the function including any points of discontinuity.

a) $\lim_{x \rightarrow 3^-} \frac{|x-3|}{x^2-9}$

b) $\lim_{x \rightarrow \infty} \frac{x-2}{x^3+8}$

c) $\lim_{x \rightarrow 0} \frac{1-\cos(x)}{x^2}$

d) $\lim_{x \rightarrow -2} 3x^2 + 5x - 2$

- 2) Write the equation of the line tangent to $f(x) = x + \cos x$ at $x = \frac{\pi}{2}$.

- 3) Find the indicated derivative.

a) $y = 2 + x - \frac{1}{x^2}$ Find $\frac{dy}{dx}$

b) $y = \sin(x) + \frac{1}{x}$ Find $\frac{d^2y}{dx^2}$

c) $y = 3\pi^2$ Find $\frac{dy}{dx}$

d) $y = \frac{\sqrt{x}-1}{\sqrt{x}+1}$ Find $\frac{dy}{dx}$

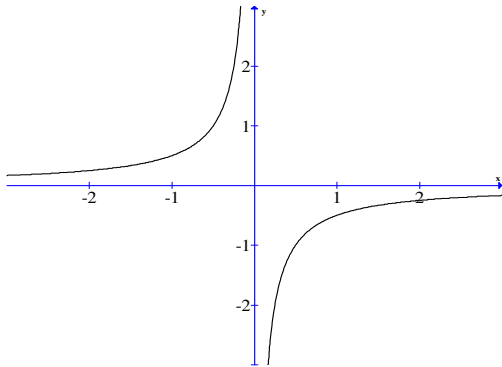
e) $y = \frac{\cos(t)}{t}$ Find $\frac{d^2y}{dx^2}$

- 4) Use the definition of derivative at a point (p. 100) to find $h'(2)$, if it exists, given that

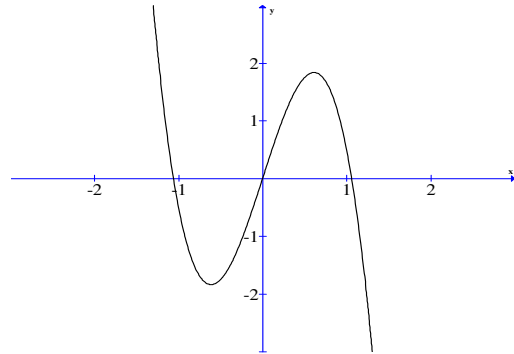
$$h(x) = \begin{cases} 4x^2 + 1, & x \geq 2 \\ 10x - 3, & x < 2 \end{cases} \quad \text{show all work and fully justify your conclusions.}$$

5) Match each graph to the graph of its derivative. Explain your reasoning and sketch both graphs in your answer.

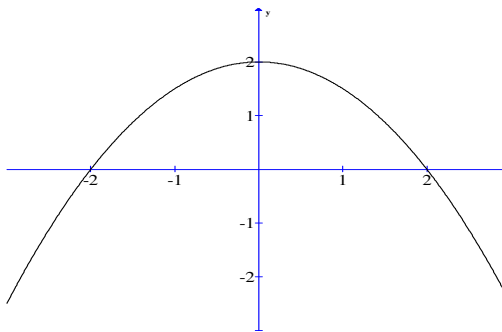
a)



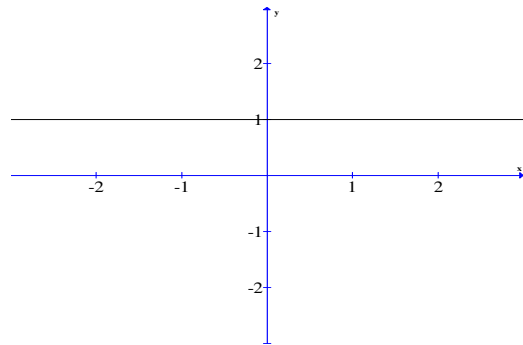
i)



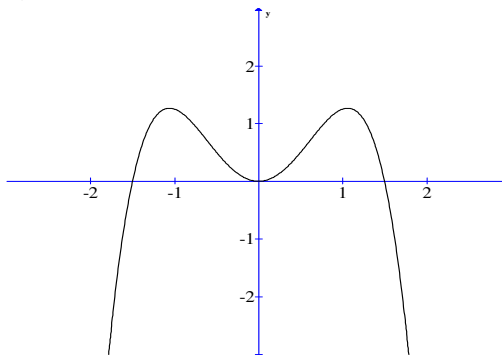
b)



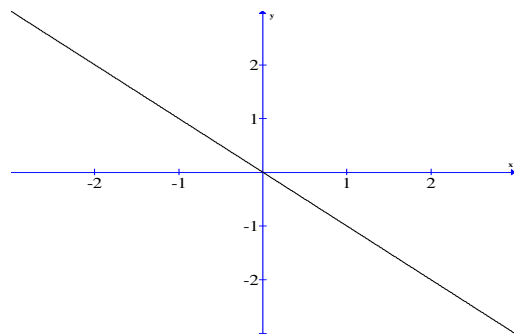
ii)



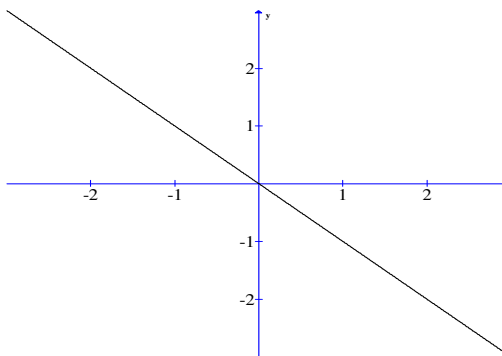
c)



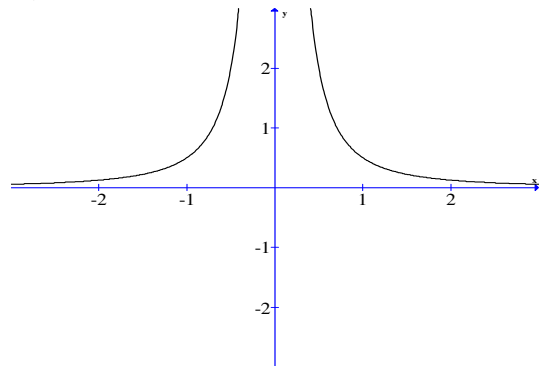
iii)



d)



iv)



Answers to Calc Weekly Review 3 0910

1)

- a) limit is $-1/6$, Discontinuity at $x = 3$ and $x = -3$
- b) limit is 0, Discontinuity at $x = -2$
- c) limit is $1/2$, Discontinuity at $x = 0$
- d) limit is 0, No points of discontinuity

2)

a) $y = \frac{\pi}{2}$

3)

a) $\frac{dy}{dx} = 1 + \frac{1}{3}x^{-\frac{4}{3}}$

b) $\frac{dy}{dx} = \cos(x) - \frac{1}{x^2}$ $\frac{d^2y}{dx^2} = -\sin(x) + \frac{2}{x^3}$

c) $\frac{dy}{dx} = 0$

d) $\frac{dy}{dx} = \frac{1}{\sqrt{x}(\sqrt{x}+1)^2}$

e) $\frac{dy}{dx} = \frac{-x\sin(x) - \cos(x)}{x^2}$ $\frac{d^2y}{dx^2} = \frac{-x^2\cos(x) + 2x\sin(x) + 2\cos(x)}{x^3}$

4) Limit doesn't exist

5)

- a) iv
- b) iii
- c) i
- d) no match